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LAND APPLICATION OF BIOSOLIDS

A GUIDE FOR FARMERS

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INTRODUCTION

Municipal waste treatment facilities process the organic matter in sewage into a uniform, dark brown to black end product referred to as ***biosolids***. Processing involves steps in which microorganisms decompose and transform the sewage. In later stages, the solids are separated from waste water. Treatment reduces the quantity of solids generated by a facility and allows waste water to be further treated before being discharged as clean water.

Biosolids are a source of plant nutrients similar to dairy, beef, or poultry manure. Like other manures, however, biosolids can contain high levels of trace elements and/or pathogens that can cause environmental, plant, animal, or human health problems. The Utah Department of Environmental Quality, Division of Water Quality, regulates biosolids to minimize health and environmental risks. Treatment facilities use various processes to render the biosolids safe for beneficial uses. Also, facilities are required by law to test biosolids on a regular basis for heavy metals and other contaminants, as well as harmful organisms. Test results dictate how biosolids can be used. Beneficial use options include mine and other disturbed land reclamation, range land improvement, or application to crop land to meet plant nutrient needs.

The biosolids produced by most treatment facilities in Utah are low in heavy metals. Therefore, application at rates meeting the nitrogen or phosphorus needs of growing crops does not pose a threat to the environment in Utah. Land application has proven benefits for municipal waste treatment facilities and farmers, including recycling of beneficial nutrients and organic matter, reduced loading of land fills, and reduced cost compared to landfill disposal.

By definition, biosolids material is not compost since it has not been blended with other organic materials and incubated at high temperatures in a compost pile. Some treatment facilities are putting biosolids through the composting process in order to kill pathogens. The resulting *biosolids compost* material can then be sold or given away for use around home landscapes and in gardens.

BENEFITS OF BIOSOLIDS APPLICATION

Utah State University is currently studying the effects of biosolids on crop growth and nutrient content. Application and incorporation of biosolids prior to the establishment of alfalfa or alfalfa with an oat nurse crop produced yields similar to those obtained with inorganic fertilizer (Table 1). Biosolids application to grass hay resulted in yield that was intermediate between nitrogen fertilizer applied at 150 lb N/acre and an untreated control (Table 2). A potential added benefit of biosolids is an increase in the nutrient content of plant tissue. In grass hay, biosolids produced significantly higher concentrations of calcium, magnesium, phosphorus,

iron, copper, manganese, and zinc than ammonium nitrate fertilizer (Table 2). Further analysis of the hay showed no increase in lead, cadmium, chromium, cobalt, or nickel concentrations with the biosolids treatment.

Table 1. Establishment-year yields of alfalfa and an alfalfa-oat nurse crop treated with inorganic fertilizer or biosolids compared to an untreated control.

Crop	Inorganic Fertilizer	Biosolids	Control (untreated)
Alfalfa	2.9 tons/acre	3.2 tons/acre	0.3 tons/acre
Alfalfa-oat nurse crop	4.4 tons/acre	4.2 tons/acre	3.1 tons/acre

Table 2. Yield and mineral content of grass hay treated with nitrogen fertilizer or biosolids compared to an untreated control.

Parameter	Nitrogen Fertilizer	Biosolids	Control (untreated)
Yield, tons/acre	3.5	2.1	1.6
Crude protein, %	10.0	10.8	8.8
Calcium, %	0.16	0.30	0.25
Magnesium, %	0.22	0.32	0.29
Sulfur, %	0.19	0.23	0.21
Phosphorus, %	0.14	0.22	0.16
Potassium, %	2.29	1.84	1.67
Iron, parts per million (ppm)	87	360	137
Copper, ppm	6.2	13	6.3
Manganese, ppm	47	62	56
Zinc, ppm	20	34	21

Farmer Requirements for Using Biosolids

Land application of biosolids should become more common as land fill costs increase and the beneficial effects of biosolids are recognized by more farmers. The decision to apply biosolids to agricultural lands should be based on economics. Contact your local municipal waste treatment facility about biosolids availability and the cost, if any, of having biosolids delivered to farm fields. Compare the cost of obtaining and spreading biosolids with the cost of your normal fertilizer program for the field on which biosolids will be applied.

Select uniform, level fields located away from residential areas and surface water bodies or wells for biosolids application. Biosolids release nitrogen slowly as the materials decompose. Therefore, when applied to corn and other high nitrogen-use crops, biosolids may not release nitrogen fast enough for maximum plant growth. However, alfalfa, grass hay, pasture, and dryland grain are crops that can benefit from biosolids application.

Treatment facilities are responsible for ensuring that biosolids are applied at the correct rate and in a manner that minimizes potential environmental and health hazards. The facility will

have a current biosolids analysis on file with which to calculate an application rate for farmers. The farmer must provide the treatment facility with the following information so they can calculate the correct application rate for the situation:

- A current soil test report showing available nitrogen (nitrate-nitrogen) and phosphorus for each field where biosolids will be applied;
- The crop to be grown and expected yield;
- Whether any other sources of nitrogen or phosphorus will be applied to the crop and in what amounts.

Treatment facilities may provide or deliver biosolids to landowners at no cost in exchange for an agreement from the farmer to apply biosolids at the predetermined rate. The facility operator may also provide instructions for post-application procedures, such as incorporation within a specified time period. Instructions may also include crop harvest restrictions designed to ensure that no harmful organisms are transferred from biosolids to the edible parts of a crop. Harvest restrictions vary with crop and include:

- Food crops that have harvested parts below the soil surface (such as potatoes) shall not be harvested for 38 months after application if the biosolids are incorporated less than 4 months after application, and for 20 months after application if the biosolids are incorporated more than 4 months after application;
- Food crops with harvested parts that touch the soil surface (such as squash) shall not be harvested for 14 months after biosolids application;
- Food crops that have harvested parts above the soil surface (such as corn), and animal feed and fiber crops shall not be harvested for 30 days after biosolids application;
- Animals shall not be grazed for 30 days after biosolids application;
- Turf (sod) shall not be harvested for 1 year after biosolids application.

General Application Guidelines

When biosolids are delivered to the landowner, applications should be made in a manner that will minimize potential environmental and health hazards. The following general guidelines should be considered:

- Where possible, incorporate the biosolids as soon as possible after application to reduce the potential for nitrogen volatilization or runoff;
- Applications should not be made to frozen or snow covered ground unless provisions are made to control all runoff;
- Applications should be kept a minimum of 30 feet away from irrigation return flow ditches, rivers, streams, lakes, or wells;
- Avoid applications on soils that are highly permeable, have a low water holding capacity, have a shallow depth to bedrock or a hardpan, have a high water table, or are steeper than 6% slope;
- Follow good irrigation water management practices to prevent surface runoff or leaching of nutrients;
- Keep good records of application rates, management practices, and field conditions at the time of application;
- Calibrate the spreader to assure that the recommended rates are applied. Calibrate by determining the tons in one spreader load and the acres that are covered, then divide the tons of biosolids in the spreader by the acres covered with one load to determine the tons applied per acre. Make adjustments to the apron speed or other settings as necessary.

Where to Go for More Information

If you would like more information about biosolids application to agricultural lands

contact your local Utah State University Cooperative Extension Service County Agent or the USDA Natural Resources Conservation Service. Either agency can assist both farmers and municipal treatment facility operators in evaluating potential sites and developing land application programs.

This document is the product of a committee formed by the Utah Department of Environmental Quality, Division of Water Quality to develop biosolids application guidelines for Utah.

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